

MOSFET - Power, Single N-Channel, SO8-FL 30 V, 1.74 mΩ, 170 A



ON Semiconductor®

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NTMFS1D7N03CG

Features

- Wide SOA to Improve Inrush Current Management
- Advanced Package (5x6 mm) with Excellent Thermal Conduction
- Ultra Low $R_{DS(on)}$ to Improve System Efficiency
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Hot Swap Application
- Power Load Switch
- Battery Management and Protection

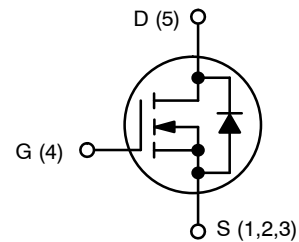
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | Symbol | Value | Unit | |
|--|--|---------------------------|-------------|------------------|
| Drain-to-Source Voltage | V_{DSS} | 30 | V | |
| Gate-to-Source Voltage | V_{GS} | ± 20 | V | |
| Continuous Drain Current $R_{\theta JC}$ (Note 2) | Steady State | $T_C = 25^\circ\text{C}$ | 170 | A |
| | | $T_C = 100^\circ\text{C}$ | 120 | |
| Power Dissipation $R_{\theta JC}$ (Note 2) | Steady State | $T_C = 25^\circ\text{C}$ | 87 | W |
| | | | | |
| Continuous Drain Current $R_{\theta JA}$ (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | 35 | A |
| | | $T_A = 100^\circ\text{C}$ | 25 | |
| Power Dissipation $R_{\theta JA}$ | | $T_A = 25^\circ\text{C}$ | 3.8 | W |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} | 900 | A |
| Source Current (Body Diode) | | I_S | 73 | A |
| Single Pulse Drain-to-Source Avalanche Energy $I_L = 50.6 \text{ A}_{pk}$ | | E_{AS} | 128 | mJ |
| Operating Junction and Storage Temperature Range | | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ |
| Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s) | | T_L | 260 | $^\circ\text{C}$ |

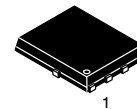
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface-mounted on FR4 board using a 1 in², 2 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown. They are not constants and are only valid for the particular conditions noted. Actual continuous current will be limited by thermal & electro-mechanical application board design. $R_{\theta CA}$ is determined by the user's board design.

| $V_{(BR)DSS}$ | $R_{DS(ON) MAX}$ | $I_D MAX$ |
|---------------|------------------|-----------|
| 30 V | 1.74 mΩ @ 10 V | 170 A |

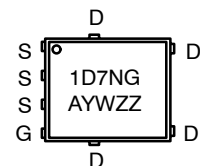


N-CHANNEL MOSFET



DFN5
(SO-8FL)
CASE 488AA
STYLE 1

MARKING DIAGRAM



1D7NG = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

NTMFS1D7N03CG

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Junction-to-Case – Steady State (Note 1) | $R_{\theta JC}$ | 1.73 | °C/W |
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 40 | |

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|-------------------|--|---------------------------|----|-----|---------------|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 30 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 250\ \mu\text{A}$, ref to 25°C | | 16 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 30\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1.0 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 100 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$ | | | 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|-----------------------------------|------------------|---|-----|------|------|------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 90\ \mu\text{A}$ | 1.3 | | 2.2 | V |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 90\ \mu\text{A}$, ref to 25°C | | -5.1 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 18\text{ A}$ | | 1.45 | 1.74 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{ V}, I_D = 18\text{ A}$ | | 46 | | |
| Gate Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 0.8 | | Ω |

CHARGES & CAPACITANCES

| | | | | | | |
|-----------------------|--------------|---|--|------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, V_{DS} = 15\text{ V}, f = 1\text{ MHz}$ | | 3780 | | pF |
| Output Capacitance | C_{OSS} | | | 1770 | | |
| Reverse Capacitance | C_{RSS} | | | 50 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 18\text{ A}$ | | 48 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 7 | | |
| Gate-to-Source Charge | Q_{GS} | | | 12 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 3 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$

| | | | | | | |
|---------------------|--------------|--|--|----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 18\text{ A}, R_G = 3\ \Omega$ | | 16 | | ns |
| Rise Time | t_r | | | 6 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 39 | | |
| Fall Time | t_f | | | 6 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|----------|---|---------------------------|--|------|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 10\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.78 | 1.2 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.63 | | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, V_R = 15\text{ V}, I_S = 18\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | | | 55 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | | 45 | | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

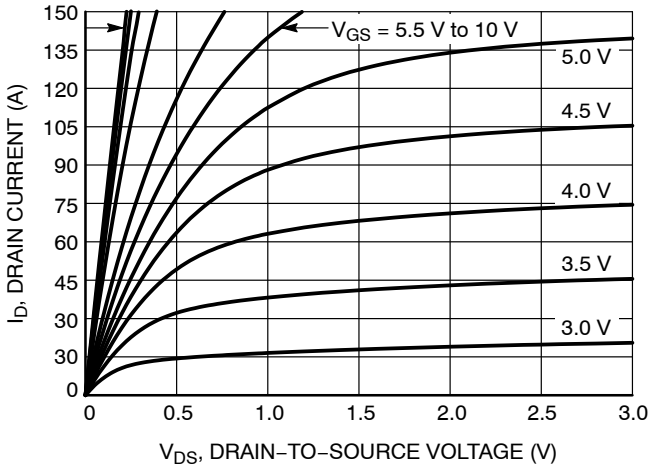


Figure 1. On-Region Characteristics

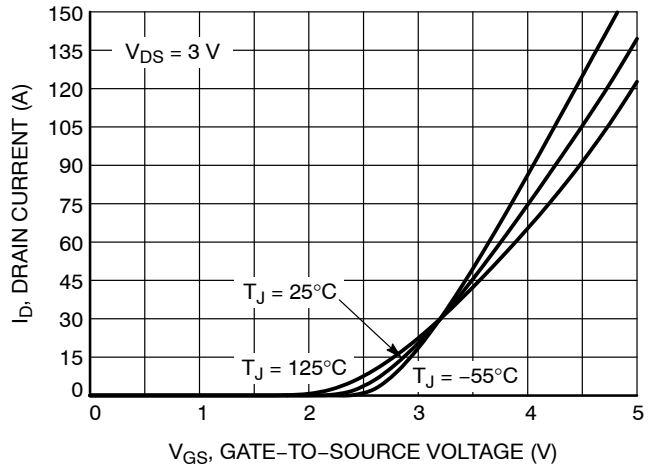


Figure 2. Transfer Characteristics

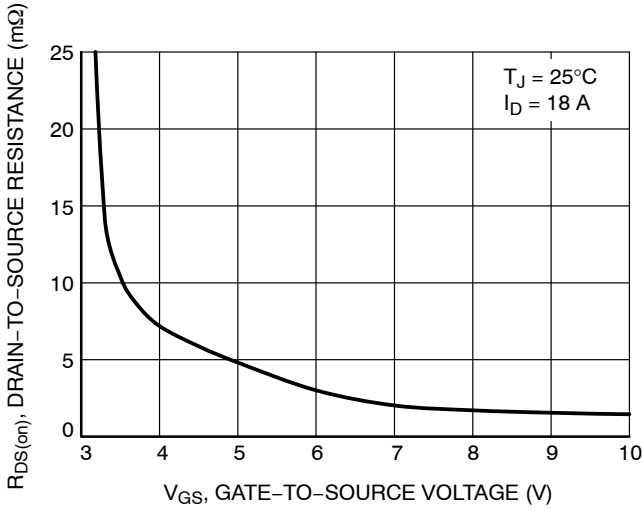


Figure 3. On-Resistance vs. Gate-to-Source Voltage

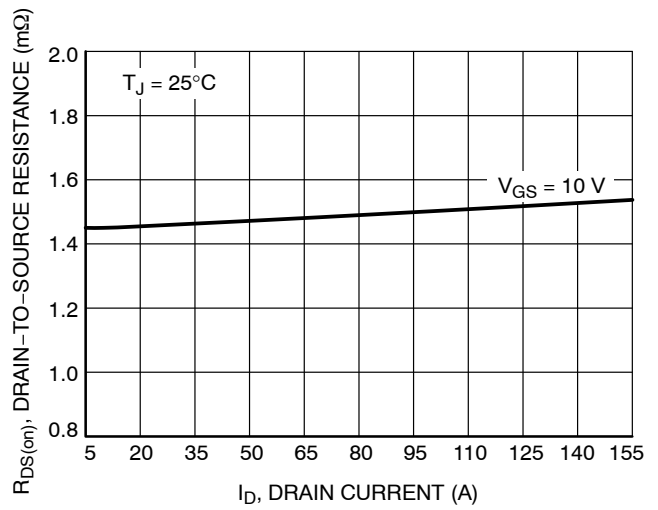


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

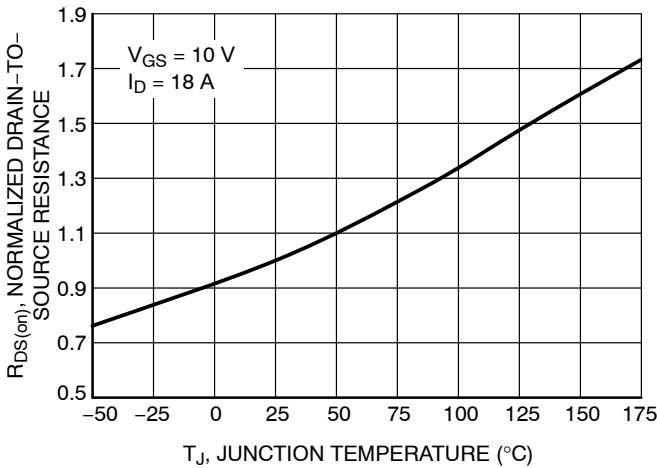


Figure 5. On-Resistance Variation with Temperature

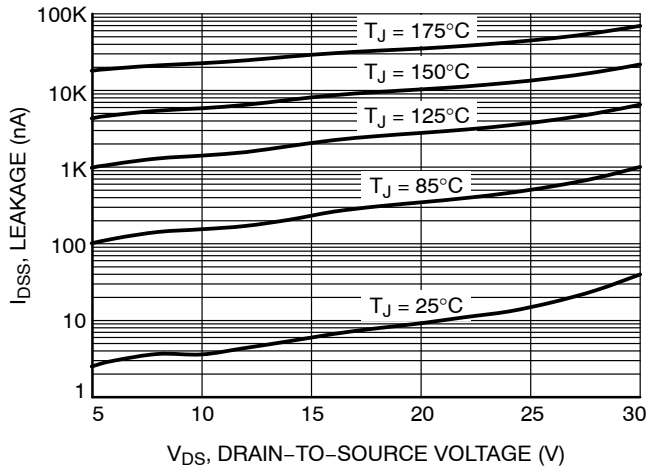


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

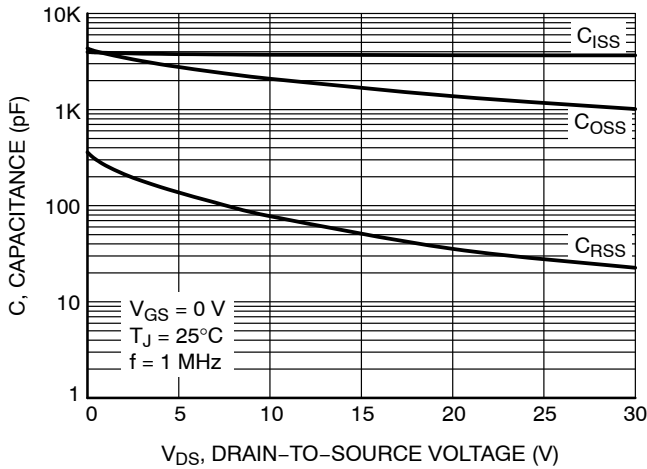


Figure 7. Capacitance Variation

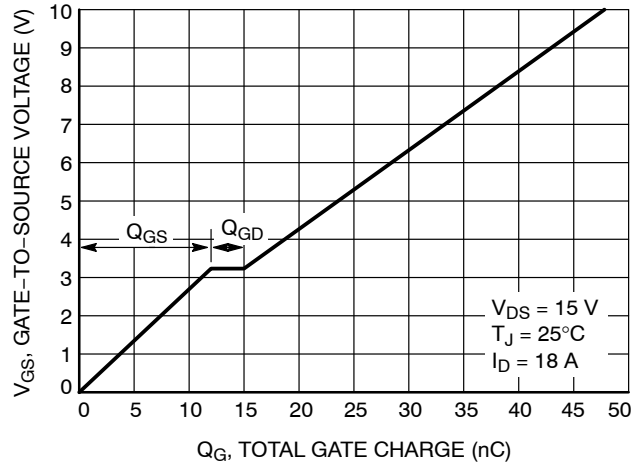


Figure 8. Gate-to-Source Voltage vs. Total Charge

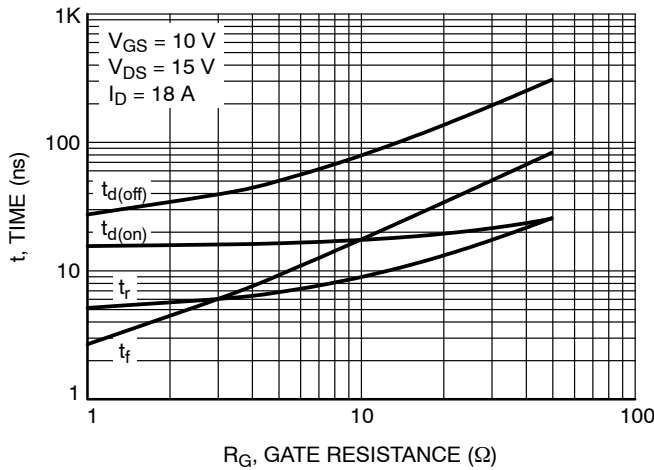


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

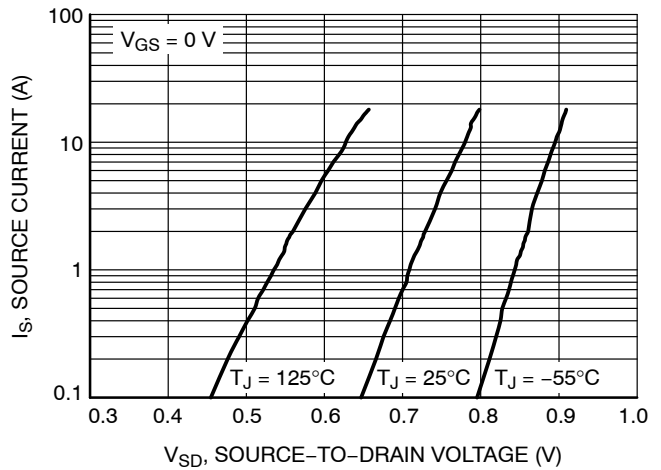


Figure 10. Diode Forward Voltage vs. Current

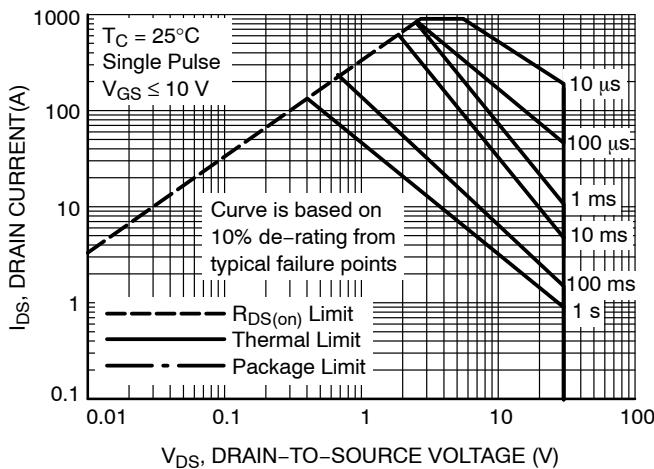


Figure 11. Maximum Rated Forward Biased Safe Operating Area

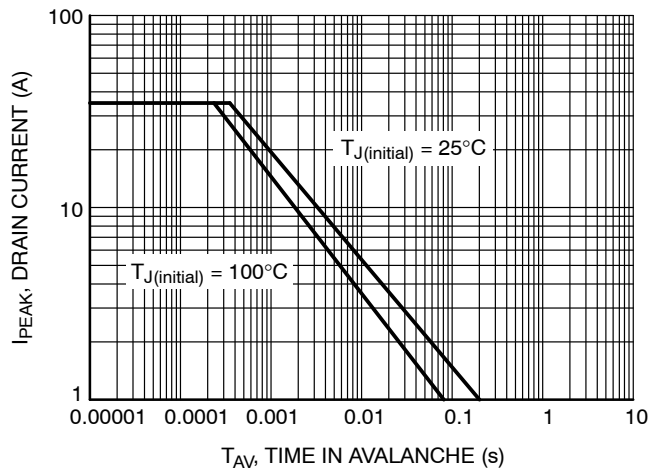


Figure 12. I_{PEAK} vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

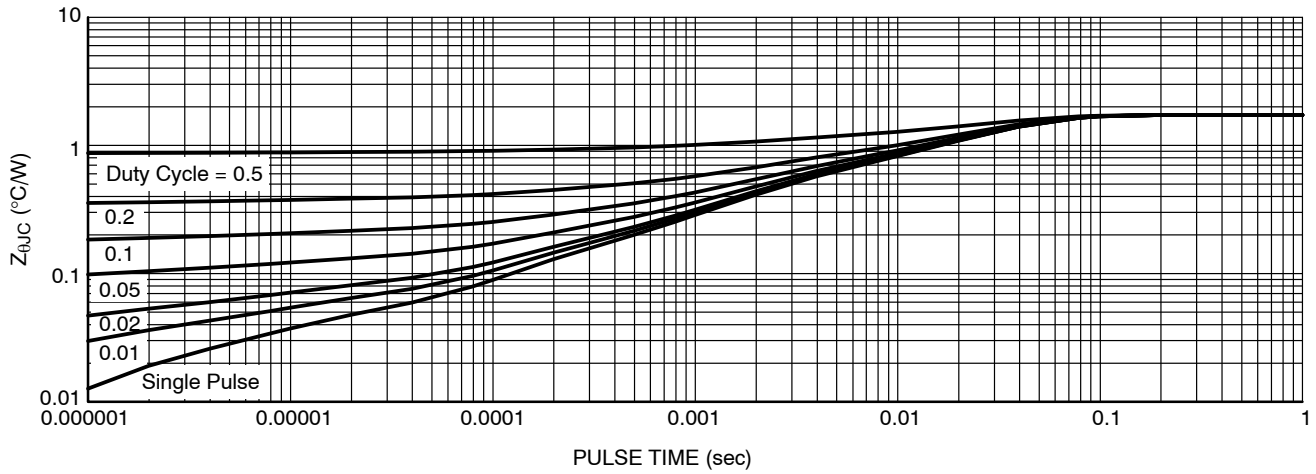


Figure 13. Thermal Impedance

DEVICE ORDERING INFORMATION

| Device | Marking | Package | Shipping [†] |
|------------------|---------|-------------------|-----------------------|
| NTMFS1D7N03CGT1G | 1D7NG | DFN5 (Pb-Free) | 1500 / Tape & Reel |

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



1
SCALE 2:1

DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE N

DATE 25 JUN 2018



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| DIM | MILLIMETERS | | |
|-----|-------------|-------|------|
| | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | --- | 0.05 |
| b | 0.33 | 0.41 | 0.51 |
| c | 0.23 | 0.28 | 0.33 |
| D | 5.00 | 5.15 | 5.30 |
| D1 | 4.70 | 4.90 | 5.10 |
| D2 | 3.80 | 4.00 | 4.20 |
| E | 6.00 | 6.15 | 6.30 |
| E1 | 5.70 | 5.90 | 6.10 |
| E2 | 3.45 | 3.65 | 3.85 |
| e | 1.27 BSC | | |
| G | 0.51 | 0.575 | 0.71 |
| K | 1.20 | 1.35 | 1.50 |
| L | 0.51 | 0.575 | 0.71 |
| L1 | 0.125 REF | | |
| M | 3.00 | 3.40 | 3.80 |
| θ | 0° | --- | 12° |

GENERIC MARKING DIAGRAM*



- XXXXXX = Specific Device Code
- A = Assembly Location
- Y = Year
- W = Work Week
- ZZ = Lot Traceability

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.



STYLE 1:

1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN

STYLE 2:

1. ANODE
2. ANODE
3. ANODE
4. NO CONNECT
5. CATHODE

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

| | | |
|------------------|--------------------------|--|
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| DESCRIPTION: | DFN5 5x6, 1.27P (SO-8FL) | PAGE 1 OF 1 |

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